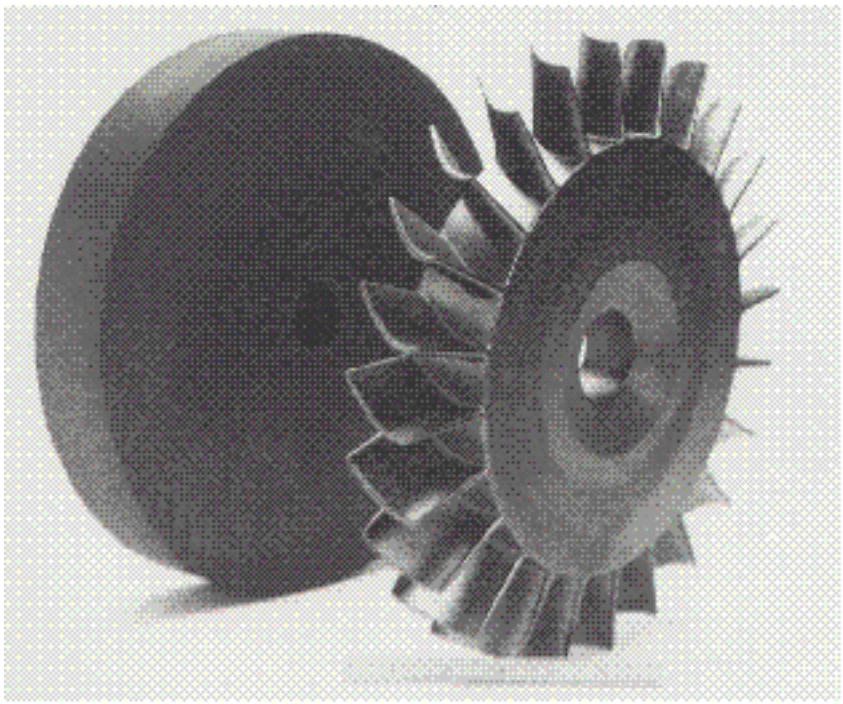
CARBON-CARBON TURBINE ROTORS IMPROVE TURBINE ENGINE PERFORMANCE



Payoff

Uncooled carbon-carbon (C-C) integrally bladed turbine rotors, like the one shown above, allow turbine engines to run at or near stoichiometric temperatures (ideal fuel/air burning temperatures) providing extraordinary performance benefits compared to state-of-the-art metallic turbines. Using an uncooled C-C turbine can substantially increase expendable engine specific thrust and reduce design and machining costs.

Accomplishment

Under a program sponsored by the Propulsion Directorate, the highest efficiency ever achieved for an uncooled C-C turbine rotor in a turbine engine was demonstrated. Results obtained with the C-C turbine rotor enabled the Directorate to attain the Integrated High Performance Turbine Engine Technology (IHPTET) Turbine Rotor Inlet Temperature (TRIT) goal for uncooled turbines four-years ahead of schedule.

Background

Allied Signal Engines, under contract with the Turbine Engine Division of the Propulsion

Directorate as part of the IHPTET program, conducted three tests of an uncooled C-C turbine rotor in a highly modified Joint Expendable Turbine Engine Concept (JETEC) demonstrator. The C-C turbine rotor configurations tested were developed by the Advanced Research Projects Agency (ARPA) under the Extended Long-Range Integrated Technology Evaluation (ELITE) program. The IHPTET program, a joint DoD/NASA/ARPA/Industry program, has the goal of doubling the propulsion capability of gas turbine engines shortly after the turn of the century. In addition to addressing expendable engines for cruise missiles and standoff weapons via the JETEC program, IHPTET also encompasses turbofan/turbojet engines for fighter/attack aircraft and turboshaft engines for helicopter and transport aircraft. IHPTET goals include increases in thrust/weight ratio, specific thrust, TRIT, and compressor exit temp-eratures as well as decreases in cost, fuel consumption, and cooling air.